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*the
teacher
talks
about
Sound
Recording*



THE TEACHER TALKS
ABOUT SOUND RECORDING

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foreword

THE FOURTH "R"

TO the traditional "three R's" of education, electronic science has added one more — the sound recorder. Its uses in the modern classroom are so many and so varied that the recorder is rapidly assuming a position of importance equivalent to that of the textbook.

To the teacher, the sound recorder is a valued "assistant" that lightens the load in practically every field of educational work. It is an "alter ego" which enables one person to be in two places at the same time — a tireless voice which ends the drudgery of constant repetition. It is an open door through which the world can be brought into the classroom — the past made to live again — the present held captive for the future. It is a yardstick by which progress can be measured — difficulties revealed and overcome.

To the student, the recorder is a mirror in which he can see himself in true perspective — from the outside looking in. He can hear and understand his own mistakes — and take pride in observing his own progress. His educational horizon is extended beyond the classroom — without limit of space or time.

After reading many hundreds of pages of recording information submitted by

teachers at all educational levels in a contest recently conducted by Audio Devices, Inc., we have come to the conclusion that it would be practically impossible to define all of the possible uses of educational recording. The opportunities for improving teaching technique and stimulating student interest and attention are practically limitless. And each application suggests additional possibilities for varied treatments to adapt a given technique or method to additional curricular matter or other educational levels. In fact, it is safe to say that the application of sound recording in modern education is limited only by the imagination and ingenuity of the user.

The following articles, selected from prize-winning entries in Audio Devices' educational recording contest, were written by people who know the subject best — the teachers who are *using* tape and disc recorders in their daily classroom activities. The subjects covered here are by no means all-inclusive. But they do include most of the generally accepted fields of tape and disc usage, as well as some rather unusual applications.

We hope that they will give you some ideas that may prove helpful in your own educational work.

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A SYLLABUS OF THE TAPE RECORDER

by

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FOREWORD

It is generally agreed that the tape recorder presents a learning opportunity which is often overlooked by teachers. It is hoped that the following outline will present some ideas and stimulate a consciousness of the tremendous learning potential that the tape recorder has to offer. These ideas are actually being employed by many Wausau teachers.

READING

Oral Reading

1. *Locating Difficulties:* The child's reading problems may be located by recording a selection read by the child. The play-back will enable him to discover the problems with which he is confronted.
2. *Self Analysis:* Letting the child hear himself read affords him an opportunity to analyze his own pronunciation problems. He will be more aware of them than if he were merely told by someone else.
3. *Fluency in Reading:* The child can be made a fluent reader by recording his reading and playing it back so that he can note the progress he is making.
4. *Audience Reading:* People tend to react differently before an audience than they do in private or in small groups. By recording this type of reading experience the child is able to single out any abnormal difficulties that may occur; whether it be a problem of voice inflection, ignoring of punctuation, emphasis, or the like.

Recording Progress

1. *Keeping an Accurate Record:* By making periodical recordings of the child's

reading, the teacher and child can determine the amount of improvement within a fixed period.

2. *Reading and The Parent:* By recording the child's reading, the parent may hear the actual oral responses in reading class. Parent teachers and Mothers' Club meetings as well as personal conferences are opportune times to demonstrate this development.

Choral Reading

1. *Student Evaluation:* Children may be their own critics for obtaining greater unison in reading by hearing what they have read.
2. *Reading for Future Program:* Choral reading may conveniently be recorded during regular class periods and played back for special programs when conditions would not permit presence of entire group.

LANGUAGE — SPEECH

Speaking

1. *Enunciation, Tone, and Expression:* Improvement of these things can be accomplished only if children are aware of them. Recordings can be made and evaluations obtained when played back.
2. *Voice Improvement:* Students may check their speaking voice when recorded and played back to them. This will enable them to hear themselves as others hear them.
3. *Foreign Language Class:* Recordings can be made to show errors and improvement. Here again the student is his best critic.
4. *Correcting Grammar:* Children can be shown their habitual grammar errors by recording them and letting the child

hear the play-back. Very often children are not conscious of their own errors.

Language Classes

1. *Extemporaneous Readers:* Weakness can be located by the reader if he records his reading. The play-back will relate to him necessary corrections, in voice quality, expression, tone, etc.
2. *Drama Classes:* The efforts of the students can be recorded and played back for criticism.

Speech Handicaps

1. *Evaluating Progress:* Make recordings of child's speech for showing parents the progress and use of language. This may be used at a mother's club or Parent Teachers program.
2. *General Speech Correction:* The tape recordings of a child's speech will enable him to evaluate himself.

Creative Writing

1. *Correction and Improvement:* Letting students record their themes and hear them as they wrote and read them, may help to detect errors made by the author.

Public Speeches

1. *Speech Class Analysis:* Speeches may be recorded and brought to the classroom for discussion.
2. *Preparation:* As an aid in presenting a speech effectively, an individual could benefit by practicing with the tape recorder.

Spelling

1. *Spelldown:* The tape recorder pronounces the words allowing short intervals of silence in which the student must spell the word correctly or sit down. This avoids possible mistakes in pronunciation since it is recorded and checked in advance. This method is especially useful in foreign language study.

RADIO

1. Often programs of educational value are missed by classes that could benefit by them because they occur at an unsuitable hour. The tape recorder enables the teacher to capture these programs and bring them into the classroom at a desirable time.

SOCIAL STUDIES

1. *Brings World Into the Classroom:* Events of particular interest and value can be brought directly to the classroom. Time and distance factors no longer exist. Whether a specific event occurs in or out of the community the tape recorder enables these events to be used in the classroom.
2. *Historical Events Made Meaningful:* Historical events can be dramatized on tape recordings. This will provide a meaningful experience for the child.
3. *Community Resource People:* All communities possess valuable resource persons. Very often their experiences



Mr. Claude D. Bickler, Assistant Principal of Lincoln School, records oral reading exercises of two young students, on a portable Bell "Record-O-fone."

cannot be shared because they do not have time to leave their places of business. By using the tape recorder, the resource person can relate his experience right in his own office or home and it can be given to the students in that interesting manner.

DRAMATIC PROGRAMS

Activity Programs

1. *Quiz Programs*: A quiz program relative to school work will provide an interesting learning experience. This can be recorded and played back for outside groups.
2. *Man On The Street Program*: This type of program may be done by any group. It can be recorded for convenient play-back to the desired group.
3. *Library of Programs*: Special interest programs may be filed in a library. Each school may easily have its own tape recorder library.

Dramatizations

1. *School Plays*: One act plays may be recorded for later play-back to other groups.
2. *Sound Effects*: In dramatic productions where sound effects are required, it is convenient to have them on recordings where the sound effects man has quick and easy access to them.
3. *Background Music for Plays*: When a variety of background music is needed for plays, it can easily be grouped into a compact unit by recording it.
4. *Rehearsing Programs*: As an aid in striving to perfect a program, it is helpful to record it and play it back for criticism and evaluation.

TYPING & SHORTHAND

1. *Typing and Shorthand Drills*: By recording dictation and playing back for drills, the teacher has an opportunity to observe the student's technique.
2. *Individual Practice and Make Up*: The teacher may prepare practice drills in dictation for individual practice. If student is absent from a regular class, make up work can be handled easily if lessons are on a recording.

MUSIC

Sharing With Community

1. *Public Concerts*: These concerts can be given over the air more easily if they are recorded beforehand. This provides an excellent opportunity to acquaint parents with the music program of the schools.
2. *Use of Our State Radio Station*: The state radio station offers the service of recording outstanding programs for the schools upon request. Only a very nominal fee is charged for this service.

Instruction

1. *Time Flexibility*: Having lessons on recording enables students to come at their convenience for instruction.
2. *Efficiency in Instruction*: By recording instructions before classes meet, the instructor is enabled to perfect them, thus making it possible for him to be more specific in his instructions.
3. *Locating Difficulties*: By recording the efforts of the student, the student and the instructor are then able to check fundamental skills or weaknesses on the play-back.
4. *Hearing Himself in Relationship to Total Ensemble*: By recording the individual student and then the entire ensemble, the vocal or instrumental student will be able to hear what part he plays within the group.

SUGGESTIONS

For more effective tape recording, it is advisable to have proper equipment, satisfactory acoustical surroundings, and an adequate knowledge of correct operation of equipment. A good recording can easily be ruined for lack of any one of these three things.

GENERAL

An activity that applies to practically all areas of subject matter is the correlation of the strip film and tape recorder.

Students may narrate the strip films themselves beforehand. The narration can be recorded and played back as the strip film is being projected. In this manner, students are active participants.

ON THE "LISTENING" ROAD TO LEARNING

by

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Listening has often been called a *spectator* sport. This is not necessarily so. Here, for example, are some of the instances in which listening is a *participation* venture.

Listening on Radio

No conscientious student would question the value of listening to the best in radio broadcasting. Careful attention to pronunciation, diction and paraphrasing, and the excellence of speech, are the marks of the master; these qualities are worthy of emulation. The student who conscientiously remarks, "I wonder how I would sound on radio", has already come a long way on the "listening" road to learning. For him, playback of a tape recording of his best efforts can be the analytical means for self-appraisal, and the incentive for consequent self-improvement. With magnetic tape, "he hears himself as others hear him".

By means of tape recording, the many excellent plays on radio may be preserved to be shared with pupils in the classroom at any convenient listening time. Rumors are hovering about us that this type of sharing is to be done on a large scale in our community. Simply by sending a reel of tape to a central audio library we shall be able to secure transcriptions of important and outstanding performances on radio and elsewhere.

Effective Learning

Children can succeed if they are made to feel important. The task of the school is to discover the avenues through which children can build and maintain the ego, thus utilizing the means for attaining success in worthwhile learnings.

Dramatic play is no mean facet of a program created and produced by a classroom

group for the enjoyment of another group or for the entertainment of parents and friends. In dramatic play we forget self; when we are poised, we can think clearly and we can act effectively. Whoever said, "To pretend a virtue is the best way to foster it" has placed showmanship in the category of good mental health techniques. Children who have formed a pattern of failure — and who, as a consequence, have become timid and withdrawn — can profit by participation in a classroom program. You should see timid Johnn's countenance light up when he listens to the transcribed program including the portion beginning, "I am Johnny Gibbon . . .".

Spotlight on the Quiz Show

It is a matter of common observation that radio quiz shows challenge old and young alike. For children, this challenge can stimulate the desire to create and produce a quiz show in the classroom. The discerning teacher capitalizes upon this opportunity for children to acquire basic academic skills while they are engaged in socially enjoyable roles. Learnings acquired in an attitude of pleasure are likely to be retained; hence, a quiz show may serve both as motivating force and as reward in the learning process.

The first playback is always a surprise to the children; they do not recognize their own voices. There may be giggles, but the understanding teacher recognizes giggles for what they are. After listening to several playbacks, the children take on an attitude of positive, constructive appraisal with a view to improvement of performance. They want their studio and make-believe radio audience to enjoy their show.

Last fall, when there came the invitation to share a good practice with fellow-teachers at an institute session, we immediately threw the spotlight on the quiz show. Not only did we present a brief transcribed show; by transcription, we also presented the teacher in a discussion of the techniques, aims, and outcomes of the practice.

Every pupil in the class group took part in the quiz show adventure. In preparation, four teams had been organized. Rehearsal was done in trial "dry-run". Then the program was recorded on Audiotape; playback followed immediately. Suggestions for improvement were friendly: "We must keep our show alive"; "We must eliminate 'dead' spots"; "We must practice correct pronunciation." Four complete shows were produced. In the final appraisal, the teacher liked the children best in one show; she liked herself best in another show. By cutting and splicing, we put together into one continuous program, the elements which represented the best efforts of all participants.

The transcribed program was an innovation. There was every indication that the audience thoroughly enjoyed the show; moreover, subsequent requests for instruction in the making of a transcription point to the conviction of the teachers that tape recording can be sound educational procedure.

Anecdotal Records of Individual Guidance

Techniques of guidance are sometimes unique; often they are individual. Perhaps

the three accounts following may belong in both categories.

There was the case of Tony, a first generation Italian lad. He was living in a trailer house with stepmother and older sister. The father was in military service. On a weekend leave from camp, the father came to us for counsel. Tony had suddenly refused to continue taking lessons on the accordion; moreover, he refused to give any explanation for his decision. The father was heart-broken. On my first visit, Tony graciously consented to play for me. For a boy of twelve, he was a fine musician. In a little private chat outside the trailer, Tony looked up at me and asked, "Do you want to know why I quit?" "You're just taking a little vacation," I ventured jovially. "No," he said, "I thought I wasn't doing very well."

At school, the teacher cleverly arranged for a program in which Tony could take part by utilizing his talent. Tony's academic achievement was not satisfactory, and his classmates were not aware of the fact that Tony could do anything well. To put the boy in a light of acceptance at school was an added purpose of the program. Tony's performance was fourth; the tape recorder made no mistake in registering that Tony's was the first for which there was any applause. For the first time in his life, Tony heard himself play; he liked it. In the trailer, thirty minutes later, the stepmother heard the transcribed accordion playing and the applause. Her voice was jubilant as she exclaimed, "That's my boy."

Tony resumed his lessons and his practice.

A teacher at Monroe School livens up the classroom routine with a "Quiz Show," recorded on Audiotape with the Crestwood "Magictape" Recorder.



Edward's problem was very different, but the solution was not. This eight-year-old was reading *wook* instead of *look*. He did not seem to hear the difference between my *look* and his *wook*. Then it occurred to me: He wasn't hearing himself at all. Into the microphone, I read the story; into the microphone, he read the same story. In the playback, Edward recognized the difference. We tried again. Edward now was saying *look*, and he knew he was saying *look* because the playback said *look*.

Nan was in the fourth grade. Her teacher felt that she needed help in reading. Nan could not read well, but she was persistent in her claims that she had read every book on the shelf. The mother felt that Nan could read better than objective tests revealed. Obviously both child and mother were difficult to approach. However, when we invited Nan to read into the microphone, we found her willing. When she heard the playback, she remarked, "It's not very good." Self-evaluation may be more blunt, but it is usually less hurtful; always it is more effective.

Evidence of Pupil Progress

Some teachers of the primary grades feel that it is valuable to have an accurate record of just how much progress pupils are making in reading. To assist these teachers, provision is being made for a tape recording of each child's performance in oral reading at the beginning of the school year. A comparison of this recording with one made

some time later provides evidence of any change in performance, not only in reading skill but in confidence as well. Every child likes to speak his name into the microphone at the beginning of the reading. Can you visualize the children sitting in semi-circle around the tape recorder listening to the playback? As he hears his own name, the child raises his hand. How eagerly he listens to hear his name spoken back to him!

"His Master's Voice"

The teacher who is sensitive to harsh-sounding voices may wish to be convinced that her own voice is pleasing. It is so easy to help this teacher become acquainted with the qualities of her own voice. The tape recorder may be left alone to talk or read into the microphone. Similarly, the playback may be arranged for listening in solitude. Thus, the teacher may hear, appraise, and plan for the goal of satisfaction. Fortunate is the teacher whose voice inspires confidence and trustworthiness, and invites listening with the ear "cocked."

In Retrospect

These experiences may not be new, but they are our own. In all of them listening is a participation venture. Perhaps in some of these instances the effectiveness of the listening was due to the fact that production was necessary before listening was possible. Be that as it may, on the road to learning we use technology; if *listening* is the easiest, quickest, and best means to attain a desirable goal, we listen.



Here, the tape recorder is used for individual guidance, directed toward the improvement of oral reading.

OUR BUSY TAPE RECORDER

by

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Home for Children

Buffalo, New York

If our tape recorder could speak, it would surely boast of the many services it renders in the educational and social life of the Immaculate Heart of Mary Home for Children. The Recorder continually travels from one teacher to another, from the Superintendent's office to the Social Workers, from the Auditorium to the Gym Hall, and from the general maintenance shops to the Kitchen crew; helping not only all the members in the teaching and child training staff, but also teaching and entertaining the young clients who reside at the Institution.

The Recorder in The School

Recordings on various subjects are obtained from a local Radio Equipment Company. These recordings are correlated with specific lessons in Science, History, Health and others. Lessons following a recorded article are more vital, interest span is longer, discussions are more animated, and retention of facts is better. Some children, who formerly showed a dislike for certain subjects, now look forward to a class period where the Recorder is utilized.

Every teacher uses the Recorder in conjunction with film strips and slide projector. The teacher first prepares the script, records it, and then plays it while the picture is projected on the screen.

Every teacher is also required to record one day's lesson to be used in case of her absence. The substitute teacher can easily take over the work and carry on the lesson in the class.

Almost every school Assembly program is recorded. The class members, who put on a program, love to listen "how the whole thing sounded" as they say it. Parts of the

program are recorded during the rehearsals for check-ups and corrections. The behavior and attention of the entire school audience greatly improved since we started to make recordings of the programs.

Remedial Reading Clinic is conducted in the school. With the use of the Recorder, the children progressed so remarkably in reading that some already graduated from the Clinic. That is, they have reached their respective reading grade levels. Marked improvement is most noticeable in diction and phrasing. You don't have to tell the child how his reading sounds. The Recorder tells him. The child makes his own conclusion and resolution — namely, to strive to advance in more efficient reading.

The church choir and the school chorus make extensive use of the Recorder. No new selection is ever rendered for the public until it is checked and corrected after listening to the recordings. It is not an easy matter to teach new Community Songs to a whole mass of children, and to split the crowd into groups requires more time for the undertaking. Now, with the Recorder, time and energy are saved. New songs are recorded by the teacher herself or by a higher grade. These are played as a preview during the Community Singing. The young audience, in no time, learns the new songs.

The cheer leaders cannot be missed. Teaching new cheers to the special group or to the whole school is immensely simplified now. The teacher records the cheer herself. And, as in Community Singing, the Recorder assists the teacher.

The Recorder has proven to be a valuable means in stimulating the study of scales

and intervals in the Band and Orchestra. The intonation is more accurate and the tones cleaner. The children do not like to hear their sour notes played back to them. The individual players record their memorized scales to compare them with recordings by more proficient players.

The Recorder also assists in Band and Orchestra practice. While I am teaching one section, a boy in the adjoining room practices his solo with the piano accompaniment recorded. In teaching trombone, clarinet or baritone section, I use this system. The boys learn their harmony parts. But when it comes to ensemble playing, they very often get lost. So, I have the cornet or saxophone melody parts recorded. The troubled group practices the harmony parts with the melody parts recorded. This has proven to be of great success.

Sometimes it is impossible for the boys to practice their instrumental duets together. So, again, I have each part recorded separately. The boy with the solo part can practice with the harmony part recorded or vice versa. This method greatly improves

the boys' proficiency on their instruments and increases the interest and desire to practice.

As we have a Band of youngsters from grades four to eight, we very often find boys who have difficulty marching in step in parades. Here again, the Tape Recorder gives its valuable aid. We record the Band marches. The boys with difficulties in marching learn the maneuvers much faster in the Gym Hall listening to their own recorded marches.

To test the soloist's memory skills, we ask the boy to join in and play with the Recorder in any part of the music which he himself recorded. This has proven to be a great force in increasing the powers of memory, thus enabling the players to give better renditions of their solos for programs.

We also use the Recorder for the study of proper instrumental balance in small ensemble groups. The Junior High Pep Band group is especially interested in playing dance music and popular tunes. We record the tunes from the radio and study the expressions and dynamics. The boys try

Right: Young cheer leaders at the Immaculate Heart of Mary Home for Children learn new cheers quickly with the aid of the tape recorder.

Below: Second grade boys test their memories by playing their school ditties on the Pre-Band instruments (Flutophones) right along with the tape recorder.



to imitate, at least in some degree, the professional rendition of various arrangements.

The Recorder in Social Work

Recorded articles on child training always precede the periodical staff meetings, serving as a source of information and inspiration.

We have already tried the following: Important speeches at Conferences and Institutes were recorded. These were played and discussed by the staff members who could not attend the meetings but had "to stay home with the children."

The Superintendent's time is budgeted. Therefore, many of her suggestions are simply recorded for the teachers, workers and even children.

Every amateur hour at the Home is recorded. Solo or group singing, recitations at parties, and various social gatherings are put on the magnetic tape. These are played during the visiting hours in the Assembly Hall. The children's visitors love to listen to the youngsters' performances.

Favorite piano music suitable for danc-

ing, as well as radio music, is recorded and played at the older children's social gatherings.

The Recorder is also used as a Public Address System. In rooms where amplification of sound is required, the Tape Recorder comes in very handy.

We would like to offer the following suggestions in regard to acoustics, especially in making chorus and instrumental recordings. Some of our rooms cause reverberation of sound. Though the Tape Recorder itself is flawless, the very sensitive microphone picks up every possible sound, the original sound plus the reverberated sound. So, for important recordings, we provide sufficient drapes and curtains to absorb the unwanted sound. If we take any recordings in the Music Room, where we have metal lockers and metal filing cabinets, we simply drape them with discarded blankets. We also pull down the window shades to prevent sound reflection from the glass. We have compared the recordings in the Music Room with and without the home-remedy acoustics and have noticed a striking difference. The children are now acoustically minded and many a discussion on the science of sound follows a Band or Orchestra practice, thus widening the children's knowledge scope.

When the children are writing letters to their parents, relatives, or friends, they have much to tell them about what we are doing with the Tape Recorder. We get many request from individual parents who wish to listen to their child's recorded singing, playing or reading.

The advantages of the Tape Recorder have surpassed all our expectations. It has aroused a great interest and understanding in the cultural and social development of the members of our Home.



A young musician practices his trumpet solo, while the tape recorder plays back the piano accompaniment.

THE USE OF DISCS IN COLLEGE SPEECH CLASSES

by

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Because I believe that speech improvement may be accelerated by varied appeal to multiple-sensory experience, I try to make use of the auditory, visual, and motor-kinesthetic capacities of the individual in my teaching methods. Audiodiscs have played a large part in these educational plans. Various experiments have contributed to the use of recordings on Blue and Yellow Label Audiodiscs over a period of six years in teaching general courses in speech improvement and in teacher-training methods courses.

There were roughly three types of students: (1) freshmen in training for vocational placement; (2) students who planned careers in radio and acting; (3) students who planned to teach speech.

In 1945 when I began working with the above students, I made recordings every two months—in late September (the first pattern, untrained), in early December, in late January, in late March and between the middle and end of May. The December recording furnished considerable shock and delight to many who had made considerable improvement. But experience in a volunteer workshop and subsequently with an accelerated group proved to me that more frequent, if shorter, recordings would produce more rapid and in some instances, perhaps, greater improvement.

A volunteer workshop—held two hours every week—was also carried on with the above mentioned students. Some of the problems studied by means of recordings were in the following areas:

1. *Problems of speech rhythm.* Students with jerky, rapid rhythm; slow, monotonous rhythm; sing-song pattern and foreign accent rhythm patterns were en-

couraged to follow methods of phrasing, intonation, and time. If a short recording were made followed by a few minutes coaching-drill and then another recording right next to the first, the student heard himself in the two patterns, was able to note the difference and to strive for the more acceptable pattern. He was given other recordings of students with similar difficulties to listen to, and in some instances could listen to a record of a student with similar difficulties and hear the whole year's progress that student had made.

2. *Problems of faulty articulation.* Here the recordings were correlated with mirror study of place and manner of articulation and work was done largely in the following three areas:

- A. *Foreign language substitution and omissions*—we had a number of (d) for (ð) with Italian-American students.
- B. Letter sound distortions and substitutions such as (θ) for (ð), (s) for (z), (t) for (d), (p) for (b), (k) for (g) and (n) for (ŋ).
- C. *Marked regionalisms*—the students in radio, drama, and teacher-training were interested in a more general American pattern and worked to eradicate some of the following: (eu) for (au) as in cow and town, (r) for (e) as in tin for ten, (dr) for (z) or variants of same as in Joisey rather than Jersey, (dr) for (ar) as in toy for tie.

Particularly with these problems I found that making listening discs of the instructor's voice with the acceptable and unacceptable pronunciation, with a pause on

the record for pupil pronunciation of the right and wrong sounds, followed by making a short recording of the pupil's voice doing the right and wrong sounds, was most helpful. I called these my *Contrast Records* and *Contrast Practice Style Sheets*. I found it was not enough to train the right but one needed to hear and drill on the wrong in order to become aware of it. Following is an example of a style sheet for the faulty (ING) sound.

Spelled word	<u>Don't say</u>	or	<u>Don't say</u> but <u>say</u>
going	gouin	gouin	gouɪŋ
doing	duin	duin	dʊɪŋ
running	rənɪŋ	rənɪŋ	rənɪŋ

Repeat (record time-space left for student repetition)

3. *Problems of Quality* were particularly helped by the corrective that comes from being able to listen to a recording of one's voice. Here our major problems were of nasalinity, types of harshness, hoarseness or huskiness, and degrees of breathiness. Much of the early work on these problems is helped by being trained to listen to the difficulty in order to set about adequate practice for elimination. A few minutes

time in recording, coaching for proper use of the resonance chambers and then a re-recording for contrast proved more helpful than weeks of practice under the old method without benefit of recordings.

4. *Problems of Pitch*. What has been said of problems of nasalinity could be repeated about problems of pitch, also.

Workshop experience taught me that frequent short contrast recordings were of more value than bi-monthly recordings of considerable length and that students who made use of workshop training made much greater progress than students in the twice a week, one hour course study.

Two years ago I had a section of Freshman English students who were not required to take any work in speech in their college curriculum (music) and many of them had serious speech faults. One day I remarked that it was a pity that they did not have an opportunity to get some speech training for I thought they had problems that would handicap them in functioning in their chosen vocation. We made a plan to spend three weeks on speech training. We attacked their chief problems and concen-

Miss Weir (left) checks the progress of a former speech-class pupil, with an Audiodisc recording. Miss Weir has found that the stethoscope provides an ideal device for concentrated listening to the students' own speech pattern.



trated on them for three hours a week for three weeks.

Here recordings were made every week and I was shocked to find that these students made as much progress as many of my students did in a semester's time in the two hour course. There were several factors which might help to explain this, but one of them, I am convinced, was the frequency of recordings and the opportunity to build on progress made. Later follow-up has proved this progress to be lasting, not superficial.

I have also used disc recordings for class demonstration. For example: (1) In 1946 we had several war-brides from England and Australia on campus. I recorded their voices in loaded paragraphs to show some of their outstanding characteristics in contrast to the American speech pattern. These records, made on blue label Audiodiscs, are still quite clear though they have been used many times in the past four years. (2) Recordings of upper classmen who have become campus leaders are played (with their permission) as they spoke as beginning freshmen and as they were speaking then . . . some at that time taking part in major stage or radio programs. (3) Recordings of my voice giving the same spoken material, with various types of interference, provided listening opportunities that could be repeated from class to class and in workshop groups. For instance, I found that each group might present various difficulties with the sound of (r). I made a recording of a loaded paragraph in which I demonstrated what the average person's speech sounds like when he is guilty of the following: (A) over-use of lips producing the various degrees of shading which when most exaggerated sounds like "wittle wed wabbit" for "little red rabbit." (B) strong back (r) made by lifting back of tongue and masking with lip rounding, producing a muffled sound often affected by young fel-

lows who want to sound mannish and gruff. (C) substitution of the (v) diphthong for the (3) sound or other variants so that one hears something like: "ai hvid ə bvid an mai wei tə wwid d̄s m̄d̄n̄ij," for "I heard a bird on my way to work this morning." (D) and on the same disc for contrast the same loaded material given with a clear front (r) and varieties of the medial and final (r).

In a course in "Methods of Teaching Speech in the Secondary Schools" we had a unit in training in voice diagnosis. Here records from the Linguaphone series of American Dialects are valuable material. Recordings of freshmen which illustrate the various types of difficulties were used for demonstration and testing purposes.

In order to incorporate more frequent class recordings I used two methods. First I selected groups of five or six who were coached before the class on specific problems, as a demonstration. Recordings were made before and after coaching to show contrasts and provide motivation for the class. Later I developed what I called the Conga-Line. Students passed before the microphone in a continuous circle, with a slight pause between each one as the recording was made of short phrases loaded with the problem sound or sounds. This was followed by listening and then coaching-drill. Students made phonetic transcriptions of work recorded. The next session or two, a second recording was made and it was possible to let the student hear his first and second pattern.

These, then, are some of the ways in which I have used Audiodiscs in general speech classes for voice improvement. When I recall the eighteen years I spent teaching without the aid of such devices, I realize that the development of disc recording has considerably increased the amount and quality of work one can do in this field.

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A NEW TECHNIQUE IN SPEECH TRAINING

by

Duncan Whiteside

Director of Radio

University of Mississippi

University, Mississippi

Most schools make extensive use of both tape and disc recorders to assist in the teaching process. In addition to the usual uses of tape and disc we, at the University of Mississippi, have developed a new approach to two basic speech problems encountered in the training of students with normal speech habits.

One of the big problems of speech and particularly radio training is articulatory in nature while the other stems from monotony or lack of variety in the reading of material aloud. There are many approaches to these problems but they all have one basic objective to be reached before effective corrective progress can be made. The student must be able to hear himself in such a way that he can identify accurately the characteristics of his speech.

Ear training alone, to reach this objective, is frequently a long, slow process with poor prognosis. The supplemental use of phonetics and/or mouth position charts speeds up the ear training process for articulatory problems and assists in the improvement of sound accuracy. These methods are effective in most cases but at best they have not proved to be as fast nor as broad in utilization as a transcription playback technique developed for use in the radio classes at the University of Mississippi.

This technique is based on a change of playback speed, adjusting the speed to best point out the speech inadequacies. It requires no specialized equipment and is simple and easy to use. Articulatory problems are usually handled at a slower playback speed. The slowed playback gives the un-

trained ear more time in which to hear more closely the sounds that are being made. This slowing also shifts the student's attention from the thought content of the material recorded to the individual sounds being made. This slowed-speed method has been particularly helpful in pointing out habitual sound omissions, sound additions, sound substitutions, and diphthongizations of vowel sounds.

Experience has dictated this general approach to the problem of the proper combination of sounds. The student is required to record a selected list of words or phrases which include his habitual deviations, leaving a short pause between each word or phrase. This recording is made on a disc at 78 rpm. This reference disc is played back at 33-1/3 rpm. for the student by the instructor, with the instructor indicating the deviations to be listened for. Once the student hears and understands the nature of his speech deviations a retraining program is prescribed. This retraining program consists of drill exercises which may or may not be supplemented by mouth position charts and phonetic work.

Periodically the student re-records the original list of words or phrases to check his progress. In order to give a closeness of comparison the original disc is used as a base to indicate progress. The disc is fed to the mixing console at 78 rpm and the student headphone monitors the disc. In the pauses on the disc the student repeats into a microphone the word or phrase previously recorded. The output of the mixed microphone and disc are fed to tape recorder and transcribed at 15 ips. This tape is then

played back to the student at 15 ips. If the student still has difficulty in hearing the sounds as played back at normal speed it may be played back at reduced speed. This comparison tape may then be erased and re-used for future comparisons. The original disc remains on file for future progress comparisons.

The other problem dealt with by the changed-speed playback technique is that of monotony, or lack of variety. This frequently stems from a habitual vocal rhythm or pattern. It is very difficult to break a habitual and monotonous speech rhythm or a repetitious inflection pattern unless the student can clearly hear and understand the pattern in question. Experience has shown that the changed-speed playback is of great assistance in the diagnosis and treatment of problems of this nature.

Patterns and rhythms become much more obvious if the playback is speeded up. Here, again, the thought content loses the focus of attention, giving the focus to the problem at hand. The training procedure is basically the same as that used for articulatory problems. A reference disc is cut, exercise material and individual instruction and criticism is provided, and at periodic intervals comparison tapes are transcribed. In this case, the reference disc is cut at 33-1/3 rpm and the comparison tape transcribed at 7½ ips. The playbacks are handled at the faster speed.

The best results in the handling of the disc playbacks can be obtained by the use of variable speed turntables, such as the Rek-O-Kut CVS-12. These permit slowing or speeding to the exact point at which the deficiency becomes most prominent and the distortion due to pitch change becomes least objectionable. The speed change on the tape recorders is more limited unless additional special diameter capstans are made for those recorders which use interchangeable capstans, such as the Magnecord PT6-A or the Eicor 115.

This speed-change playback technique can be used to good advantage on any dual speed recording equipment available and many variations might be made according to the equipment at hand. It can be an all tape process or an all disc process; however, the method suggested above has proved to be the simplest and least expensive. The technique was originally developed for classroom use while using a Brush Sound-mirror and a Presto disc recorder with a Masco amplifier as the mixing console.

It should be pointed out that, although this approach can bear fruit regardless of the equipment used, the better the equipment the better will be the result. While the range of voice frequencies is comparatively small, the transcriptions and the playbacks should be of wide range with a minimum of distortion and background noise for best results. Crispness of reproduction is a characteristic much to be desired. Bad transients and high intermodulation distortion can frequently muddy reproduction to the point that the deviation becomes completely masked to the student's ear. The very best equipment your budget will permit will more than repay in improved instruction, better results, and satisfaction of operating with lowered operation and maintenance costs.

Refinements in the use of this technique and additional experimentation are planned following the installation of new equipment in our new radio studios. The new equipment consists of: a Collins console, rack mounted Ampex 400 tape recorders, McIntosh recording and monitoring amplifiers, RCA 70-D transcription tables, Rek-O-Kut CVS-12 variable speed turntables for variable speed playbacks, and an RCA LC-1A monitor speaker. Red Label Audio-discs are to be used for the reference recordings and red oxide plastic base Audio-tape is to be used for the comparison transcriptions.

TAPE RECORDING IN EDUCATIONAL THEATRE

by

James W. Thompson

Yale University

Drama School

New Haven, Connecticut

The Yale Drama School Theatre first made use of tape recording about four years ago when a Magnecord PT6-A Recorder and several public address amplifiers were purchased. They were received so enthusiastically that a console was built to house the system and provide for multiple input and output mixing. The quality of the amplifiers was not too good, so new ones are now being built. The new system will be ready in another month and will consist of the following:

- (1) Magnecord PT6-A Recorder
- (2) A home-built recorder amplifier similar to the Magnecord PT6-J Amplifier
- (3) Two 16" Rek-O-Kut turntables with Livingston arms and Clarkson cartridges plus a third arm and cartridge for LP records
- (4) Two microphone inputs with separate preamps
- (5) Two output amplifiers based on the Williamson circuit, but using push-pull parallel output tubes to give about 24 watts of output each
- (6) Four loud speaker channels
- (7) Complete monitoring system from any point in the network

The entire system is no less than dual channel at any point, making it possible to carry on several functions at the same time. The tape recorder is removable and portable; and both the tape recorder and the main system may be operated independently of each other.

The photograph shows the main audio system console with tape recorder unit on left (removable), vertical attenuator type mixing controls in center (preamps mounted behind panel), and output and monitor controls at right. The covers have been removed from the base to show output amplifiers and power supply. All amplifiers and preamps plug into wiring gutters along back, and are easily removable for service.

Another unit about the same size houses the phonograph turntables.

The sound requirements for each production are quite varied. Since tape recording is a relatively new medium to us, we are still in the process of discovering new tricks that can be done with it. Here is a partial listing of how we have used tape:

Background Music. The legitimate theatre has long been jealous of Hollywood's ability to use suitable music as background for motion picture sequences. Orchestras are too costly for the average university theatre, and recorded music of the proper quality and duration could not always be found. Now LP records have increased the quality while the tape recorder has made it possible to select those passages of the composition which are suitable, and to rearrange them in sequence and even repeat them over and over without any noticeable break in the music. To accomplish this our recorder may be fed from any or all of the three phonograph pickup arms.

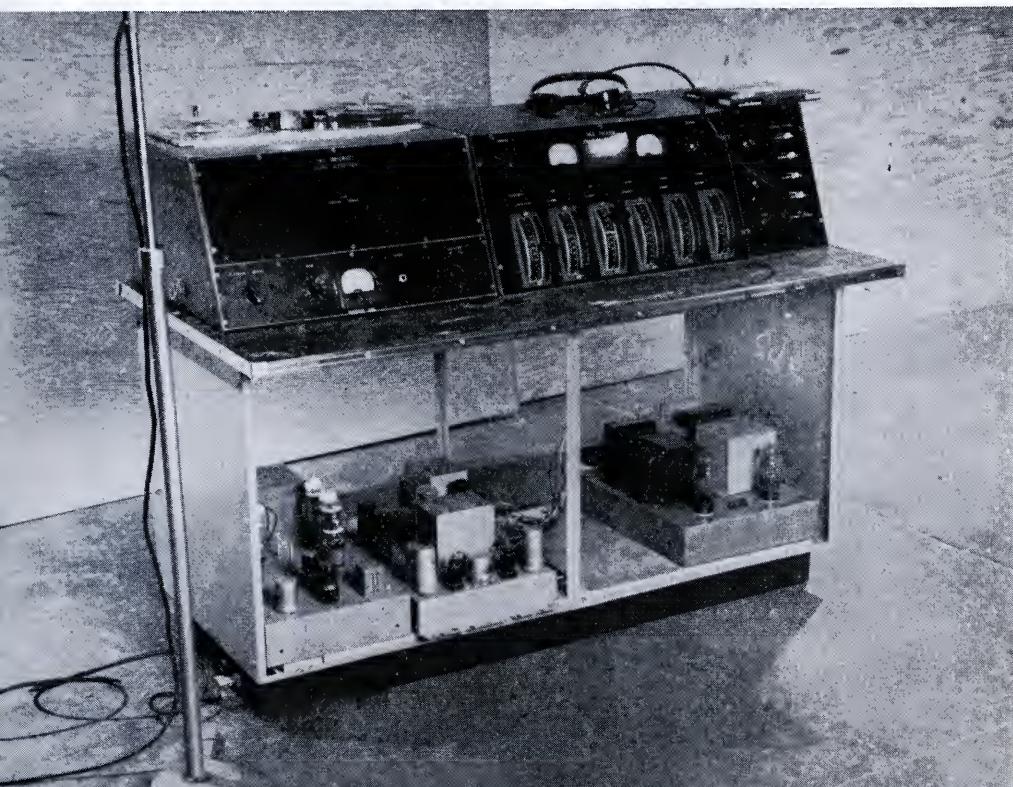
Specially Recorded Music. Occasionally the more ambitious director has special music composed for the production. The task of finding someone to play these special compositions at all rehearsals and performances is usually not worth the effort. Even if a musician can be found who is willing to give so much of his time, there is still the problem of teaching him the cues and finding some place backstage to set up his instrument or orchestral group. However, the portable tape recorder makes it possible to make a good quality recording at the musician's convenience, perhaps even at his own home or studio. There is an added advantage to using recorded music in that there is no possibility of unexpected mistakes in playing if the original recording is accurate. What's more, the playback level can be varied to offset noise in the audience.

Since our sound booth is located in the theatre balcony, the operator can see and hear the action of the play at all times. This greatly simplifies the problem of accurate cueing.

Even after a recording has been made it is not too late to make changes in it, without having to re-record the live music. Here are two specific examples:

The music for the "Common Glory" pageant in Williamsburg, Va. was tape recorded at the University of North Carolina. I remember one summer when there was a sudden change in tempo in some of the ballet music which the dancers just couldn't seem to follow. Re-recording was out of the question, and we were too close to opening night to restage the dances. The problem was solved by making a tape duplicate of the music, and then searching this

Main audio-system console of Yale University Drama School, with tape recorder unit at left, attenuator type mixing controls in center, and output and monitor controls at right. Covers removed from base to show output amplifiers and power supply.



duplicate for a sustained chord of suitable pitch. One was found and was spliced into the original tape at the point where the change in tempo took place. This extra beat in the music gave the dancers the required time to regain their balance. Over 65,000 people saw the show that season and were not the least bit aware of the trick we had done with the music.

The second example was a simple variation of the same trick. A bassoon solo specially recorded for a recent Yale Theatre production ended in a sustained note; but the note was not long enough to time out with the action. We made duplicates of the note from the original tape and then spliced these duplicates onto the end of the original. Once again the flexibility of tape recording helped us out of difficulty.

Sound Effects. There are many sound effect records available; but rather than use them during the performance, we prefer to make tape copies of the entire sound effect, or whatever portions of it we wish to use, and then play it on the tape during the show. This eliminates the possibility of using the wrong side of the record, does away with the sometimes ticklish problem of dropping the pick up at exactly the right point, saves wear on the record, and greatly simplifies cueing. If the effect does not last long enough on the record, it can be tape recorded several times and then spliced end to end.

A recent production called for a continuous effect of the sea pounding against the shore. It seemed a waste to use two hours worth of tape for this effect; so a short length of tape was made with the surf effect recorded on it. The two ends of the tape were spliced together to form a continuous loop. The recorder was turned on its side and the tape was allowed to loop down to the floor and back up again. The tape was started at the beginning of the show and allowed to run by itself without attention throughout the entire production.

Off Stage Voices. When an off-stage voice has to be amplified or run through a

filter system to produce unusual effects, it is usually better to tape record the voice. This eliminates the possibility of extraneous noise being picked up by the mike during a show, and guarantees that the effect will be the same for every performance and rehearsal.

In the situation where an actor goes off stage to make a costume change and has to carry on dialogue with someone on stage while making the change, a tape recorder is almost a necessity. By allowing the recorder to deliver the off stage actor's lines, he is free to make his costume change without having to concentrate on what is happening on stage at the time.

Cueing Tapes. We mark the tape cues in two ways. The easier is to mark the back of the tape with a china marking pencil. However, we have not yet found a solvent which will remove the mark without removing the oxide binding on the other side of the tape. The second method of marking is to splice in a length of leader or timing tape; but in order to reuse the tape all of these leaders must be cut out of tape at the close of the show — and there are usually over a dozen of them. In any case, the tape for a show is always marked for each cue in sequence; and if a cue is repeated it is recorded twice on the tape. This eliminates having to rewind the tape during the show, and reduces the chances of wrong cueing. Any unused tape is wound off onto another reel so that the show tape contains only the actual cues for the show.

Although we have never experienced any difficulty in recording through a splice in the tape, we use new tapes for the final production tapes. The old tapes are erased and used for experimental productions, tentative tapes for rehearsals, etc. Although our recorder runs at both 15 and $7\frac{1}{2}$ inches per second, we use the slower speed since the difference in fidelity is usually not great enough to offset the saving in tape costs. When the new output amplifiers are finished the difference in fidelity may become more apparent.

TAPE RECORDING AT THE BERKELEY OPERA WORKSHOP

by

John E. Meeker

Director of Recordings

Berkeley Opera Workshop

Berkeley, California

The Berkeley Opera Workshop is a function of the Berkeley Adult Evening School which aims to provide a class for those persons who are interested in singing in an opera production or playing in the orchestra for the production.

At the moment the group is rather small but those who come are very much interested in it and we are planning on putting on a production in the near future. Meetings are held twice a week in the new music building of the Berkeley High School. For our productions we have available the complete facilities of either the large community theater with its great stage or the small Little Theater which is more compact.

The use of recordings in conjunction with the activities of the Opera Workshop consists in making spot checks of rehearsals and complete recordings of performances given on the stage. Both of these uses give the members of the group an opportunity to hear themselves in action. The original recordings are made on Audiotape and disc copies of excerpts are available to those who wish them. A master copy of each complete recording is copied onto discs to be filed as a permanent record of the group's accomplishments.

The recording equipment is furnished by one of the members who is operating a more or less non-profit recording service and is very much interested in the activities of the Opera Workshop. The tape recorders

are Magnecord PT6-AH units operated from a custom built recording amplifier. The amplifier has facilities for mixing three mikes and is also equipped to dub from tape to tape. The present disc recorder is a Presto 6-N machine which is used for making the disc copies of tape recordings. All original recordings are made on tape and then copies onto discs. The tape machines are equipped with carrying cases and a changeover switch for continuous recording on location. An accessory gadget that has been picked up is a small hand crank which fits over the spindle and into the slots on the tape reels. This simplifies hand rewinding during a performance when the

Typical recording setup as used for making rehearsals tests during class session of the Berkeley Opera Workshop. Equipment shown includes two portable Magne-corders and separate amplifier chassis.



recorders are in a position which would make use of the motor rewind out of the question due to the noise produced. A tape speed of fifteen inches per second is used when recording for the Workshop and that allows fifteen minutes in which to rewind the reel and place the new reel on the machine ready for operation. It has also been found that the noise of rewinding by motor gets picked up by the other tape when recording.

When the equipment is used at the class sessions for making spot recordings of the rehearsal, the recorders are set up at the rear of the classroom so that the operator can watch the director and receive instructions from him as to what and when to record. The mike is placed on a boom and put in a front-center position where it will give reasonably adequate pickup of the singers and piano. With a small group it is easier to figure out the mike placement than it is with a larger group due to the fact that the larger the group the more spread out it will be in a sideways direction. In actual operation the director of the group requests that specified portions of the music be recorded and then played back immediately. During playback he will point out any special items that he wishes to bring to the attention of the class.

During the past year, two complete opera productions have been staged by the class in the big community theater which will seat three thousand persons. Complete recordings were made of each production and the results were quite good, especially for a first attempt. The first production was *Aida* and it provided an excellent opportunity to find out by trial and error how to record a live opera complete with chorus, orchestra and principals. The mike placement was figured out by guesswork plus a bit of semi-experiment at the dress rehearsal. For this opera the mike was hung from the spotlight bridge approximately over the center front of the stage just back of the main curtain. There was no practical way of stringing the mike in front of the curtain and it was also desired to keep the orchestra from drowning out the chorus and soloists. Experimental recordings made

during the dress rehearsal provided some idea of how well the orchestra would be picked up from a position near the footlights. The mike was about fifteen feet above the stage floor which was a prominent position. However, there were three other mikes hanging at the same level to provide p.a. reinforcement when needed so the "looks" factor was put aside for this production. The results achieved with this mike placement were sufficiently good to warrant its continuance with slight modifications at the next opera production. The second opera we staged was *Die Fledermaus*. This time there was spoken dialogue to record as well as music. The mike was again hung from the spotlight bridge but this time it was placed so that it barely protruded beyond the edge of the horizontal border fringe of the main curtain. This put it about thirty feet above the stage floor and yet there was still plenty of reserve gain during the singing. The mike used was an Electro-Voice dynamic microphone which was suspended vertically facing the floor of the stage. This position provided a 360 degree angle of pickup and resulted in surprisingly good balance between singers and orchestra. The only other mikes we had available were velocity type instruments which nullified their usefulness since they reinforced the orchestra as well as the singers. When we have the necessary equipment we will place two cardioid type mikes in the footlights to pick up the action at stage right and stage left. That will give better results when the principals are off at the edges of the stage and at a great distance from the central mike.

The recordings of the show were played back for the class soon after the weekend of the performance and they thus had a chance to hear how they had actually sounded. Of course, the balance between orchestra and singers was not the same on the recordings as it was to those sitting in the audience but we did not aim to duplicate that particular set of conditions. In fact, the balance on the recordings was better than that out in the audience. All members of the group who wanted disc copies of portions of the show were given

an opportunity to order what they wished and before the tapes are re-used a master copy will be made for the class files.

It is hoped that in the near future we will be able to make spot checks of the orchestra rehearsals as well as continuing with the chorus rehearsal checks. We find that this procedure is of great help in smoothing out rough spots in the blend of the ensemble since the members of the group can hear for themselves what they sound like in combination with other voices. While singing they are primarily conscious of their own performance and perhaps the performance of the person next to them but find it difficult to achieve an adequate conception of the total sound produced by the group. The playback of the tape shows

them how they are related to the other singers and whether or not they stand out too strongly as individual voices when it is desired to produce a smooth blend of composite voices. All musicians should have periodic practice recordings made so that they may study their performances and spot the little flaws that may not be very noticeable during the actual performance. A recording gives a permanent record of a fleeting sound and can be given close study under relaxed conditions with a resulting improvement in technique and interpretation. We of the Opera Workshop are thoroughly convinced of the importance and practical value of high quality recordings as an aid to the study of music and the performance of music.

PROFESSIONAL COACHING VIA TAPE

by

Daniel Seidman

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New York City

I am a Junior High School teacher and almost all teachers of grades three through nine must present plays. Since I am a health education teacher, my ability as a dramatic director is sorely limited. I discovered an easy way out of my predicament which proved to be most successful.

I recorded a play directly onto my tape. I took it off a long playing record but it isn't necessary to tell you that I could have taken it from almost any source . . . radio, television, etc. I then cut the tape after every two minutes of playing time, especially where the natural break came in the dramatic presentation. I then spliced onto the tape blank, unrecorded tape . . . about five minutes of playing time. In other words, I had two minutes of the original

play followed by five minutes of blank tape, two minutes of play continued from where it was cut, five minutes of blank tape and so on.

The final step was to record the children on the blank tape after they listened to the characters present their parts on the two minutes of the recorded tape.

The children heard and reheard their parts presented by the professional actors and then listened to their own voices in imitation of the experts. Of course, all their errors were easily noted.

Incidentally, I used leader tape after each splice upon which I wrote all pertinent information . . . the names of the characters, children, etc.

TEACHING FRENCH WITH TAPE

by

Fernand L. Marty

Le Château

Middlebury College

Middlebury, Vermont

The French Department of Middlebury College is developing a linguistic workshop with one main objective in view: To give its students an active command of spoken French.

Sound recordings are used in two types of courses:

- (A) courses in spoken French for beginners
- (B) courses in remedial French

Our courses in spoken French for beginners are designed for students who have a thorough knowledge of their vernacular and whose linguistic background includes two or three good years of Latin or of a Romance language.

These courses are based on the assumption that the spoken form of a language is the primary form of communication and that it should be taught first. We also believe that this country, being called, as it is, to play a preponderant role in international affairs needs more and more linguists with an active command of languages. In addition to those two reasons, equally true for all languages, there are two special reasons pertaining to the special nature of spoken French:

(a) French spelling represents an archaic state of the language. Handling spelling and speaking at the same time would create confusion in the students' minds and retard progress in both fields. The French system of sounds cannot be assimilated properly if the students' efforts are hampered by the simultaneous study of an orthography which bears little resemblance to the phonetic system it should represent.

(b) French is not spoken word by word but by breath-groups where all words are run together and lose their individuality. Native spoken French cannot be understood if one tries to visualize in one's mind the spelling of every individual word. From the very first day, students should be trained to understand French spoken breath-group by breath-group, by a native, at normal conversational speed. Comprehension should be immediate; the sentence should not have to be repeated.

On such a basis, *recorded* material is the only material made available to the students. No blackboards, no books are used for the first five months. The class, limited to twelve students, meets every day for one hour. Conversational patterns introducing living vocabulary and basic oral grammar are taught completely orally by a native French instructor. A summary and a review of the work done in class is then recorded on tape with additional conversation exercises. The students do their "homework" in the Audio-Laboratory. They listen again to the material acquired the same morning. They repeat the conversation exercises and record them on paper discs. Thus, they are able to compare their pronunciation with the instructor's pronunciation on the master-tape.

The use of tape in our Audio-Laboratory presents the great advantage that informants, as used in the Army Specialized Training Program, are not needed. Such informants very often did not follow the instructor's advice and not being trained in linguistics would very often lead the

students astray and undermine the instructor's work. With tape, the instructor can control both the class-work and the laboratory work.

Frequent examinations are given. They are designed to test the student's comprehension ability and also his conversational ability. The individual conversation examinations are recorded and every student has an opportunity to listen to his recorded examination. His mistakes are explained and corrected at that time.

After five months of such intensive work the student has mastered enough oral material in order to be able to speak easily on a variety of subjects. He feels confident of his ability to understand a native Frenchman without too much difficulty. It is then, and only then, that reading is introduced. All reading selections are based on material acquired and mastered four or five months before. The student reads his text *aloud* while listening to a *recorded* version of it. In such a way, the student is not influenced by the archaic spelling. With the instructor's voice as a guide, he runs little risk of losing the phonetic correctness already achieved.

Spelling is reduced to its just importance, that is nothing more than a *conventional* system of representing speech. After the first basic principles of French spelling have been explained, little class time is spent practicing spelling. Students can do their own practice, listening to a recorded text and checking with a master text. Thus, even after spelling and reading have been introduced, class time is mostly given over to conversation practice.

It should also be added that the instructor teaching such a course can ask other French natives in his department to record part of the course material on tape, thus giving the students a chance to get accustomed to various voices and intonations.

Such courses introducing French in a natural and logical order achieve a far greater measure of success than courses using a written presentation. Thanks to the use of

recorded material, our students achieve, after one year of study, levels of comprehension and speaking ability far superior to those obtained in courses using the so-called eclectic method; and, at the same time, they do as well, and quite often better, in spelling.

We use the following equipment:

(a) One tape-recorder. At the present time we have a Brush Soundmirror type BK-401. Though we find it rather satisfactory, we should like to replace it since we have found out that students achieve better results when they have at their disposal an excellent machine, reproducing perfectly the voice of the instructor.

(b) Paper disc recorders manufactured by "Magnetic Recording Industries" in New York.

(c) Four individual sound proof booths.

Our courses in remedial French are designed for students who already have a good knowledge of French but whose pronunciation is poor. Such courses deal mostly with the correction of errors in articulation, accent, rhythm and intonation. The method we used was devised by Professor Pierre Delattre of the University of Pennsylvania. Every week a new type of error in pronunciation is explained in class. Different methods of correction are explained and demonstrated. The students, then, can use the facilities of the Audio-Laboratory and do the following:

(a) Listen carefully to Professor Delattre's Records and repeat.

(b) After sufficient practice, record the same sentences on paper discs and compare with the master record.

In addition to that drill work, students record a short text once a week. Every recording is filed by the instructor, thus giving him a permanent record of every student's progress from the beginning to the end of the course.

Recorded literary selections read by famous French actors are available to the students, thus giving them an opportunity to cultivate their voice and read their liter-

ary texts with expression and emotion.

The following equipment is used for our courses in remedial French:

(a) 6 phonographs RCA Victor equipped with Brush earphones.

(b) 4 paper disc recorders, manufactured by Magnetic Recording Industries, Ltd., of New York.

(c) Fairchild Portable Recorder for acetate discs.

(d) 5 sets of Professor Delattre's recordings entitled "Advanced Training in French Pronunciation."

(e) A record collection of over 300 records consisting mostly of literary selections recorded by well-known French actors.

Before ending this article, it should be

added that we are constantly enlarging our record collection, not only for our courses in Phonetics but also for our courses in Literature since we feel that no literary text can be fully appreciated unless it is *heard*. Our students in Literature courses are therefore encouraged to make full use of our record collection. Most of our records are supplied by Goldsmith's Record shop in New York.

We should also add that we are in the process of copying most of our records on tape, thus keeping our records practically new while the students use tape copies which are just as good as the record itself, but with the added advantage of being unbreakable and practically everlasting.

A corner of the linguistic workshop at Middlebury College's French Department, showing the Brush tape recorder, playback phonographs, magnetic disc recorder and portable acetate disc recorder in use during a typical French study period.



TAPE RECORDING IN PUBLIC SCHOOL MUSIC

by

Frank H. Groff

Director of Music

West Hartford, Connecticut

Public Schools

We first began to use recording about seven years ago by having our high school concerts recorded on discs by an outside firm. We would then listen to the records and analyze the weak and strong points of the performance. However, this was a little too much like "locking the stable after the horse was stolen." We needed to have the opportunity for self-criticism and improvement *before* the big public performance, not after.

We first purchased a Webster-Chicago wire recorder which proved very handy in revealing such weaknesses as wrong notes, ragged entrances and releases, faulty intonation, etc. This machine did not have a wide enough frequency response and other characteristics to give a reproduction particularly of our larger groups which would reveal that most elusive of goals—tone quality.

As the outside recording firm had been selling two or three hundred records to our students after each concert, we decided to buy our own equipment and amortize the cost by making and selling records of our concerts. We bought an Ellinwood semi-portable disc recorder for approximately \$750. It had a dual-speed $17\frac{1}{4}$ " turntable and overhead lathe cutting mechanism. We mounted it on an aluminum hand truck which the shop teacher had outfitted with plywood slots to accommodate all the various sizes of discs both new and used. There was also a place for the mike.

One of the most unique and valuable uses we made of this equipment came when we started to rehearse our all-school show.

This was an original musical comedy involving the senior choir, vocal swing quartet, dance orchestra, and modern dance club. In the past, the several numbers which combined all of these elements were not brought together until the day before the show—and then we had to interrupt school routine drastically to do it. Then we would find that the physical education department at the opposite end of the building had gotten a different idea of the music for their dance than our arrangers. This necessitated a lot of last minute changes. It was also difficult to rehearse the choir separately from the dance orchestra accompaniment. With the new recorder this was all changed.

We rehearsed the dance orchestra and swing quartet before school and then recorded their numbers. We played them during choir period with volume turned up while the choir sang their own parts. This not only gave the choir members a perfect idea of how they fit into the whole arrangement, but it also allowed me, the arranger, to actually hear for the first time an arrangement which I had previously only been able to "auralize" mentally.

We then played the 33-1/3 rpm recording while at the same time we picked up both choir and the recording on our Shure Unidyne mikes to make a new composite recording at 78 rpm. Playing this record on their regular equipment in the gym, the dance instructor was able to rehearse the dances under actual performance conditions. This recording technique really paid off in terms of time saved, better performance, and less frayed nerves at show time.

The above took place at Passaic Valley Regional High School in Little Falls, N. J. After coming to West Hartford in 1948, we began to change over to tape. Starting at first with several Wilcox-Gay disc recorders and RCA wire recorders, we acquired several Magnecord PT6 professional portable tape recorders and a considerable number of smaller Eicor twin-track tape recorders for the various schools.

Under the leadership of Mr. Richard W. Morton, our full-time audio-visual director, a radio studio with control room, Magnecoder, and a leased wire to one of our local radio stations (WCCC) was set up in our Alfred Plant Junior High School. School activities on every level are recorded during the week from all over the system. The tapes are edited and spliced into a half-hour program complete with "School Days" theme song by the high school choir and then broadcast every Saturday morning over WCCC.

Several other radio stations broadcast tape recorded selections from our high school Christmas concert. By using two Magnecoders with a throw-over switch we can record continuously at 15" per second to get 50-15,000 cps fidelity. With Maxmixers we can have multiple channels for the microphones we need to pick up over three hundred students involved in these concerts.

In our last two Spring Concerts we have had a finale involving the Choir, Girl's Glee Club, and Mixed Chorus totalling over 300 voices accompanied by the high school orchestra. We used the same techniques described earlier but this time with the Magnecoder. We played the orchestra recording through the auditorium amplifier for the 200-voice chorus and the orchestra and choir recordings through the record player in the music room. This record player I had assembled with a Brook 10-watt amplifier (frequency response of 20-20,000 cps with $\pm 1/2$ db) having a remote console pre-amplifier with three channels—two high gain and one low.

The equipment also includes a 12" dual speed Rek-O-Kut turntable, Livingston transcription pick-up arms, and GE Variable Reluctance magnetic pickups. The Jensen 15" speaker is mounted in a deluxe

Jensen Bass Reflex cabinet up on the wall to give the room full coverage.

The Magnecoder plugs right into the low gain channel of this outfit to give us fine quality and ample volume on the playback. We sometimes play commercial recordings of a number we are learning to give the students an all-over picture of what they are trying to do. We learned "And the Glory of the Lord" from Handel's "Messiah" far quicker and easier because we had a recording of exactly the same arrangement in the same key. We played it once while choir and pianist listened and followed the notes with their eyes. Then we turned up the volume and choir and accompanist did it with the record very successfully the first time! This reduced the initial rehearsal time to learn a contrapuntal number of this kind by hours. Later we recorded our choir and contrasted the two recordings, one right after the other.

We make so many uses of recording in the music department that I can't mention them all. Sometimes we record room noise as students enter the room and get ready for rehearsal. We only have to play back a portion to get the students to sheepishly realize how they sound. After several periodic checks the decline in room noise is notable. Sometimes we do radio-style scripts in assembly with the English department. We record sound effects, bridge and background music from live performances or from records on the Magnecoder and have them all set for the script. We habitually try to get our music appreciation classes to listen to certain radio programs with varying degrees of success, but when we want them all to hear an especially fine program without fail, we simply take home a recorder and record it from the radio by wire connection and then play it in class. This way they can't escape.

I want to emphasize the importance of having equipment of high enough quality for the intended use. Any money spent on inferior recorders is thrown away. It is also vital that the recorders be easily accessible without the barriers of time, red tape, distance, complexity, lack of trained student operators, lack of correlated equipment

such as matching connectors, mikes, cords, etc. to limit and hamper their use by non-technical minded teachers.

Having just returned from the Audio Fair in New York, we are interested in the possibilities of Bi-aural recording as demonstrated by Magnecord. Startling realism is obtained by recording with two mikes 6" apart simultaneously through two amplifiers and a double recording head. The resulting tape is played through two speakers or two earphones with a resulting

third-dimensional quality that really makes the music thrillingly alive.

We are also contemplating the installation of a Concertone professional basic recorder mechanism in with our record player in the Hall High music room so that we will always have it right at hand and release our portable Magnecorders for other work.

When we realize the flexibility of the tape recorder we know that we are just scratching the surface of tremendous possibilities of recording in music education.

THE TAPE RECORDER IN A PROPAGANDA UNIT

by

Sidney B. Simon

Senior High School

Bradford, Pennsylvania

My tape recorder probably got its most convincing workout, recently, when we were studying a unit on propaganda. It was a pupil-interest project that was really very simple and yet that made a point that hit home with an impact that would have been hard to equal in any other way.

Here is how it worked. I told a story and cut it on the tape recorder. I found that an account of an automobile accident served to motivate itself and also brought to the class another blow for safety's sake. I made use of a room off of our library, although any large closet or storage room off of another room would serve as well, and called in the students one at a time. The first student listened to my account of the accident on the playback, and then he recorded his own version of the story. The second pupil listened to the first pupil's version and then recorded his account of the story. And so we worked our way through the class --

each person listening to the playback of the story version of the student before him, and then recording his own telling of the same story.

The next day all the tapes were listened to in sequence. Immediately there was a roar of laughter as they saw how their own version had differed from my original, and then with paper and pencil, we kept notes of the changes that were made in each successive story, and we spotted the trends and patterns which revealed the most consistent inaccuracies.

It is amazing how convincing the experiment can be, because the tape never lies. As an outcome following this little experiment, it was almost humorous to observe the accuracy they demand of each other now, and fewer stories—gossip, propaganda, or rumor—ever get blown up out of proportion. What better weapon against propaganda and rumor mongering than recorded truth!

TAPE RECORDING IN CARDIOLOGY

by

*J. Scott Butterworth, M.D.
Associate Professor
of Medicine
University Hospital
New York, N. Y.*

The teaching of cardiology at New York Post-Graduate Medical School has posed many problems. Cardiology, or the study of heart disease, depends to a great extent upon training the sense of hearing and particularly the appreciation of low frequency sounds. For a number of years we have been engaged in developing and working with an electronic type of amplification that would exactly reproduce the sounds a physician hears through his own stethoscope. This seems rather a simple proposition but it is complicated by the fact that the frequency of the sounds produced by both normal and diseased hearts is in the low spectrum. Most of these sounds are below 200 cps and go as low as the threshold of audibility at the intensity produced by the heart (there are many frequencies below the threshold which we do not hear).

It was formerly necessary for each student to examine a patient individually with his own stethoscope. This not only consumed a great deal of time and wasted the time of the group, but also left much to be desired as far as a teaching method was concerned since the instructor was never entirely sure of what the student was hearing.

We now use a system composed of a special microphone for picking up the sounds from the patient's chest, a good amplifier flat in the low frequency range and multiple electronic stethoscopes so that an unlimited number of students may all listen at the same time (see illustration). We have found loud speakers rather unsatisfactory because of the very low fre-

quencies which in a room that is not specially sound conditioned tend to feed back even at low intensity. With this equipment we are able to examine patients with ease, accuracy and speed and at the same time to visualize the sound at the same instant it is being heard, on a special 16 inch tube coated with a long persistent material. There are many times, however, when we do not have a patient easily available to illustrate the particular subject in which we are interested and that is where tape enters the picture.

We originally used discs for our records but were troubled by surface noise (which stands out much more where only lows are present) which tended to become more pronounced the longer the record was used. We turned to tape for the solution and we now have several recorders which have been adapted to the recording of heart sounds.* This requires extremely good fidelity in the range from 500 to 20 cps and the additional use of filters to accentuate certain frequencies in this range.

Over a period of time we have developed a large library of tape recordings of all types of heart sounds and murmurs so that we are no longer dependent upon the presence of an actual patient. The records may be played in continuous recordings

* These recorders are not commercially available at present but any tape recorder having good low frequency characteristics may be adapted. Our recorders were originally developed with the fine cooperation of Mr. Jack Bieger of Tapetone Corporation.

of an hour or more with lectures and comments interspersed or endless tapes may be used to play a certain type of record endlessly until the student has had plenty of time to become accustomed to the sounds. Most of the recording is done at $3\frac{3}{4}$ " or $1\frac{7}{8}$ ", which enables us to put a lot of material on a 7 inch reel and which does not detract from the low frequency response.

This system of tape recording has many other advantages: It is easy to edit the tapes; it facilitates teaching since the re-

ord may be played as long as desired by either the instructor or the student; it produces a permanent record of a patient at a given time. The latter is most useful in following changes in the sounds of an individual patient over a period of months or years, or in illustrating the changes that occur as the result of our modern cardiac operations where certain types of cardiac murmurs may be entirely abolished by the proper surgical procedure. The field is still new and the possibilities are relatively unlimited.

Right: This special tape recorder can be used in place of the patient, with the output fed to stethoscopes and also to the Educational Cordioscope shown below. The continuous tape shown here plays 30 seconds at $3\frac{3}{4}$ " or 1 minute at $1\frac{7}{8}$ " per second.

In this typical demonstration setup, the microphone on the patient's chest feeds the heart sounds into the amplifier of the Educational Cordioscope. Output goes to the individual stethoscopes and also to the cordioscope tube. Tape recordings can also be made at the same time.



SOUND RECORDING AT YAKIMA RADIO WORKSHOP

by

Miss Murle J. Birk

Director of Radio Education

Yakima Public Schools

Yakima, Washington

"On Mike" is a by-word around the Yakima Public Schools where education is wired with sound. The Radio Shack, which is situated on the campus of the Senior High School is the only school radio set-up of its kind in the Pacific Northwest. In Yakima, Washington, radio broadcasting is used to teach communication techniques, to coordinate the community with the school, to develop student responsibility, and to formulate judgments in radio listening. This is not a vocational training unit; instead, the radio workshop is established as a speech project in conjunction with a program of radio education for the city school.

There is no transmitter equipment, but seven weekly broadcasts are presented from the Radio Shack over remote lines to the three local radio stations. In addition to scheduling the broadcasts, network affiliates KIT, NBC-ABC; KIMA, CBS; and KYAK, MBS, stations in a city of 50,000 population, serving a listening audience of 170,000 cooperate by maintaining the three telephone lines and paying all line costs to their transmitters and studio control boards. All programs are sent out over these lines and taped at the transmitters or studios for play-back at selected times.

An army portable provides the shell for the Radio Shack, which includes a reception room-office, director's office, elevated control room, large studio, (a seventy-five piece orchestra can be accommodated), small studio audition-booth combination, (this will seat thirty-five people in case an observation broadcast demonstration is being presented), music — sound effects library, and furnace room.

Broadcasting equipment is owned by the

school district. The Radio Shack is equipped with a Gates Studio Consolette, Magne-corder, (recording speeds $7\frac{1}{2}$ and 15), Brush professional recorder, (recording speeds $7\frac{1}{2}$ and $3\frac{3}{4}$), sound truck with two Gates two-speed transcription tables, (play-back speeds of 78 and $33\frac{1}{3}$), portable Presto disc cutter, (cutting speeds of 78 and $33\frac{1}{3}$), three position Western Electric microphone, Shure dynamic microphone, Altec salt-shaker microphone mounted on a Dazor arm for control room use, two Amperite microphones for office communication, R.C.A. standard boom, two twelve-inch monitor speakers, three eight-inch monitor speakers, non-professional two-speed turn-table with Webster amplifier and Bell and Howell speaker for the music library, one radio tuner, one R.C.A. radio, five Cannon microphone outlets, Langworth transcription library, and sound effects library.

Lime greens, chocolate brown, and lemon yellow predominate in interior decoration. Radio students planned and designed the inset microphones and radio flashes inlaid in the marbelized linoleum floor. Chalk pastels by high school art students are hung on the walls.

Kindergarten classes through junior college classes of the school curriculum become Kilocycle Klassrooms. Every learning area is represented during the regular broadcast schedule of the year. Language arts dramatizations, social science panel discussions, musical concerts, science interviews, club meetings, assembly programs are only a few of the actual programs and combination of programs represented.

Without the mechanical aid of the recording industry this audio project could not exist. When the Yakima program of educational broadcasting first began eight years ago, the disc recorder was the keynote of the program with sixteen-inch transcriptions being used for all programs aired. The emphasis now is mainly one of tape recording. Not only is the tape less costly and of better quality, but the tape recording offers greater flexibility in program planning.

Recording is used in the following ways for Yakima Public School broadcasts:

1. All radio programs of the Department of Radio Education are "aired" from the Radio Shack. Each program is sent "down the line" to the station transmitter or station studios where an engineer on duty tapes or re-tapes the programs. Live broadcasts, taped broadcasts, and a combination of the two make up the general procedure. This recording is done on Magne recorders, or Ampex machines. (KIT and KYAK use Magne recorders and KIMA uses the Ampex).
2. Classroom activities, assemblies, special programs, interviews, concerts, and meetings are taped in the elementary schools, junior high schools, senior high school, and junior college. The Radio Shack initiates and organizes these special service features. High school students in radio production do the engineering, announcing and general organization involved in securing these remote presentations.
3. Broadcasts can be taped at the Radio Shack during regular class time or at the convenience of the group broadcasting. Live originations constitute 75% of the school programs. Then, all programs going down the line are re-taped at station transmitters or studios on a definite scheduled basis.
4. The Radio Shack has special lines which are connected through the console of the inter-communication system at the senior high school.
 - a. Rauland-Borg with amplicall
 - b. Duo-channel
 - c. Central institutional sound distribution system
 - (1) Radio — FM and AM
 - (2) Plays all size records and speeds
 - (3) Microphone pick-up from central points
 - (4) Tape-recorder for recording or play-back (Brush)
 - (5) Inter-comm
 - (6) Transmits to room, group of rooms, or whole school
5. Visiting speakers either for civic or educational sessions are taped by high school students. These programs are analyzed by the group sponsoring the speaker or played back at regular meetings so that those who could not attend might hear. High school students do the technical work.
6. City schools send tapes that have been made on their school recorders for a second copy to be made. These are



A portion of the elevated control room at the Yakima Radio Shack, showing, left to right, Presto disc recorder, Brush tape recorder, Magne recorder and Gates Studio Consolette.

often exchanged with other schools having like projects in various learning areas. This technique is also used in re-recording borrowed tapes from the County Library and State College and University audio departments.

7. The tape recorder is used continuously during rehearsals of our radio workshop and production classes. A student can then check on his interpretation and voice work at all times.
8. Radio programs received over local radio stations are recorded at the Radio Shack for use in schools throughout the school district.
9. It is possible to cut discs from tapes or discs from discs or tapes from discs with our Presto cutter. We use it both as studio equipment and on remote jobs. This machine also provides an extra piece of play-back equipment.
10. Special programs are taped for civic clubs, community drives, and educational organizations. These are done at the Radio Shack where the school broadcasting equipment is used under the supervision of student engineers and production directors. These programs are played back at meetings of the particular groups originating the program.
11. Taped programs of appropriate music are prepared by radio students and sent over the line to the cafeteria at the senior high school during the noon hour.
12. Sound effects and special production aids are often taped and then transferred to a disc for use on broadcasts and to supplement the record library.
13. Discs are made of students' speaking voices, discussion and debate groups, musical selections, assembly programs, or broadcasts to be filed as permanent records.
14. Disc recording is done here for the speech classes so that each student will have a record to mark his improvement.

Two hour high school classes in radio workshop and radio production coordinate this radio activity in addition to presenting a major part of the actual broadcasts. The junior college broadcast is done by junior college students in cooperation with the radio education activities of the Yakima public schools.

Students are responsible for airing seven weekly broadcasts. Included in this program schedule are four thirty-minute programs and three fifteen-minute shows. Engineering, producing-directing, writing, acting, announcing, narrating, sound engineering, and musical selection are done by the students during the regular two hour class periods. In addition, good listening habits and program evaluation are stressed with this audio program.

Yes, it's "On the Air" with the Yakima Public Schools.

Student-made disc recordings, being played back on the Gates transcription tables to a third-grade audience. Three times a week, elementary school classes make field trips to Radio Shack.



BUILDING A LIBRARY OF RADIO PROGRAMS ON TAPE

by

Harold Hainfeld

Roosevelt School

Union City

New Jersey

What are the reasons your teachers give for not using radio more in the classroom? Some of them may be: (1) The radio program does not come on the air at the time of day when I can use it; (2) Programs are not at the proper time of the year to fit our curriculum; (3) I can not prehear a radio program and would like to know what my students will listen to; and (4) If I assign after school listening, it may not be heard by all students.

Once a radio program goes "off the air," it is usually difficult to borrow a transcription and almost impossible to keep it for use in the classroom. There are many radio programs worth saving for future school use.

One of the solutions to these problems is for the classroom teacher, radio chairman or audio-visual coordinator to save valuable radio programs on tape. In a short time the school or school system can have a library of important curriculum materials. If a radio program has enough merit for use in the classroom, serious consideration should be given to making a tape recording of it for future use when the program is unavailable on radio. It can easily be erased if the program is of limited value.

Being located in northeastern New Jersey, two FM educational stations are within our range; WBGO-FM, Newark and WNYE-FM, the New York City station. Both transmit a full schedule of programs during the school day. These programs, however, are designed to meet the curriculum needs of their schools. Many of the topics are also studied in other classes, but

not at the same time. Making tape recordings of these programs makes them available at any time of the day or year.

In making school-made tape recordings of radio programs it is important to have good equipment. This is not necessarily expensive. The Freed-Eisman "Educator" radio used in many schools has ample frequency response. Don't impair the quality of the reproduction of the radio program by using a recorder with less. One with a higher frequency response is unnecessary for this purpose. There are many tape recorders that have this response, priced about \$200.00. The radio has an outlet to permit direct recording from it into the tape recorder and any outside noise will not be reproduced on the tape.

Schools with a radio and tape recorder can build up a library of useful radio programs. Federal Communications Commission regulations permit the use of tape for this purpose, provided the recording is not sold as a commercial project.

The storage of tape reels is no problem. They are small and compact. The tape reel is approximately the same size as a reel of 8 mm. film. Many photographic dealers have cans and containers for the home movie maker. Schools can use this 8 mm. equipment for permanent storage of their tapes.

Don't overlook the possibilities of making tape recordings from commercial radio programs. Most of these stations, in addition to transmitting on AM wavelengths, are also broadcasting on static free FM. Record from the FM band; it has a higher frequency response and almost no inter-



Above: This class at the Roosevelt School is "all ears" as the portable tape recorder plays back an educational radio program. Programs recorded on tape can be kept indefinitely—used whenever needed at any time of the day or term.

Principal of Roosevelt School, Charles E. Brown and Miss Anne Naddeo, teacher, listen to a radio program from WNYE-FM, being recorded on tape by 88 student Rhoda Lampidis of the Audio-Visual Squad.

ference. With the program on tape, it is easy to edit it and eliminate the advertisements and announcements. Thus, a 30 minute broadcast can be made into a 23 minute tape recording, leaving plenty of time in the usual 45 minute period for the teacher to introduce the program to his class and time for follow-up activities afterward. The recorders are light and portable and easy to bring home from school to make after-school recordings for in-school listening.

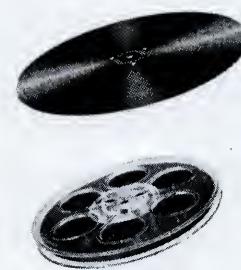
There is another possibility for the radio-tape recording combination. WNYE-FM presents a science quiz, where students from two junior or senior high school classes try to answer questions on their science studies. Having the program on tape enables the teacher to let his students hear the question and stop the recorder before the answer is given. Thus, the students in

class can answer and discuss the question before the answer is given. This procedure would be impossible with the radio.

Schools, school systems and county educational departments are building film and visual aids libraries. Audio-Visual and Curriculum personnel should not overlook the possibilities of inexpensive audio libraries of valuable radio programs on tape.

Radio and recording equipment are usually less expensive in comparison to projectable equipment. The combination of radio and tape recorder will allow the teacher to pre-hear programs. Previewing films before use is an important part of proper utilization. With the program on tape, it is possible for the teacher to know in advance what his students will hear. Building an audio library of radio programs that meets curriculum needs is an important step in using these aids in teaching.

QUICK FACTS ON SOUND RECORDING METHODS



You don't have to be an audio engineer to use sound recording equipment effectively. However a familiarity with the basic principles involved will be of value in helping you answer some of the many questions which are sure to arise from the ever-curious student body. Hence, the following brief discussion of the subject.

Basically, there are only *three* types of sound recording and reproduction in use today — the mechanical method (disc recording), the magnetic method (tape and wire recording), and the optical method (recording sound on photographic film).

THE MECHANICAL METHOD

This is the oldest and probably the best understood method of sound recording—dating back to Edison's invention of the phonograph. Basically, the recording operation consists of cutting a modulated groove in a mirror-smooth lacquer surface, the modulation or "wiggles" in the groove corresponding to the waves of sound being recorded.

In the earliest, and hence the simplest recorders, the groove modulation was obtained mechanically, by allowing sound waves to strike a flexible diaphragm, the corresponding movement of which caused the stylus to swing as the groove was cut. One form of this is illustrated schematically in Fig. 1.

To make this modulated groove "talk back," the disc was rotated while the needle rode in the groove. As the needle moved from side to side, the diaphragm was moved in and out, generating sound waves of the same pattern as originally recorded — as illustrated in Fig. 2.

In modern disc recording the method is essentially the same, except that the direct diaphragm and stylus linkage is replaced by electrical devices of higher fidelity. Sound waves striking a microphone are translated into a modulated or varying electric current which is amplified and fed to a cutting head which causes a corresponding lateral movement of the cutting stylus. This is illustrated in Fig. 3. In playback, the sequence is simply reversed, as shown in Fig. 4.

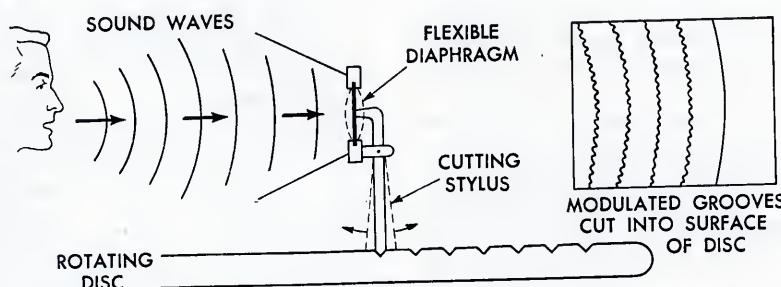


Fig. 1. Simplified schematic diagram illustrating principle of early disc recording method.

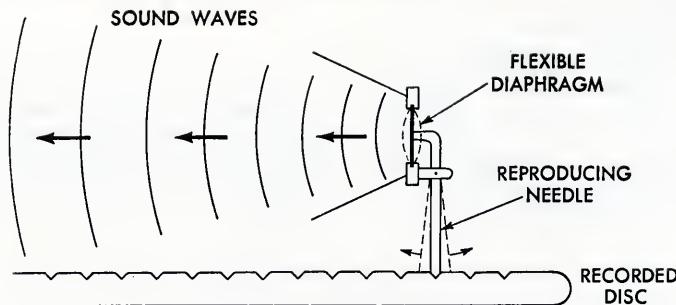


Fig. 2. Simplified schematic diagram illustrating principle of early disc reproducing method.

This method, where the recorded grooves are modulated from side to side is called lateral recording, and is the one most widely used in all modern disc recording work. There is also another method in which the cutting stylus moves up and down, varying the depth of the groove. This is called vertical recording, a method still used to a limited extent.

Disc recording is used extensively by professional recordists — in radio stations and commercial sound studios — for making electrical transcriptions and "masters" for commercial phonograph records. A disc recording can be played back instantly, and its storage life, for all practical purposes, can be considered as *permanent*.

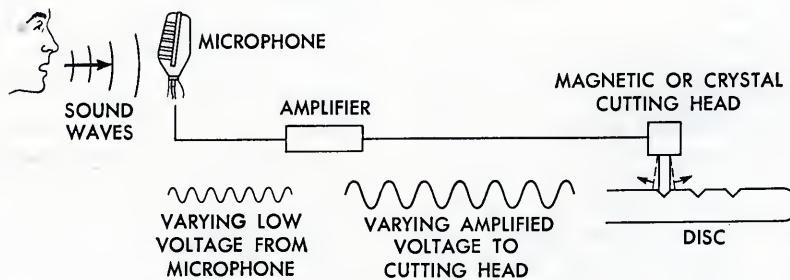


Fig. 3. Simplified schematic diagram illustrating electronic method of modern disc recording.

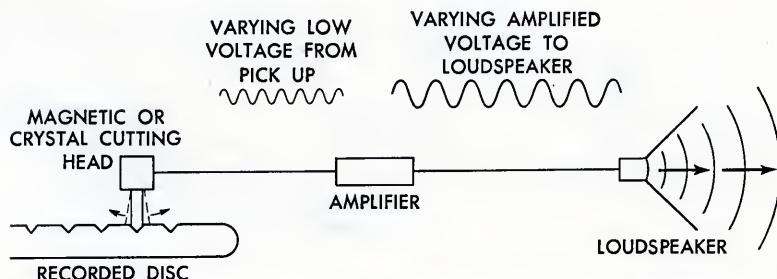


Fig. 4. Simplified schematic diagram illustrating electronic method of modern disc reproduction.

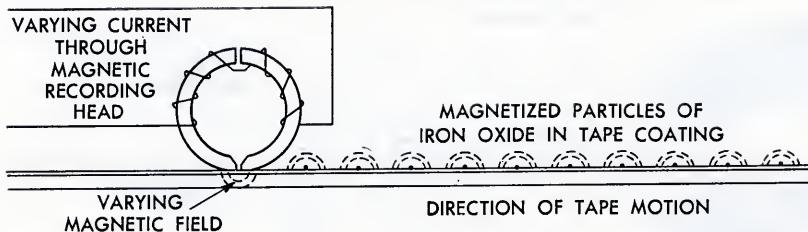


Fig. 5. Schematic diagram illustrating principle of magnetic recording method.

MAGNETIC RECORDING

To understand the relatively new method of magnetic recording, let's review a few fundamentals of magnetic theory.

Every wire in which there is a flow of electric current is surrounded by an invisible magnetic field, which varies with the strength and direction of the current. When this wire is formed into a coil with an iron core, the strength of the magnetic field is greatly increased and localized. Any magnetic substance, when placed in a magnetic field, also becomes magnetized — and has its own magnetic field. And when a magnetic field is moved past a wire, (or coil of wire), a voltage is induced in the wire, in proportion to the strength and direction of the magnetic field.

With these facts in mind, let's look at Fig. 5 — a simplified diagram of a tape recording head and magnetic tape. The tape surface is covered with a thin layer of very uniformly dispersed fine particles of magnetic iron oxide. A current of varying intensity is passed through the recording head, generating a magnetic field of correspondingly varying intensity. As the tape moves past the head, through this magnetic

field, the oxide particles in the tape coating become magnetized, retaining their magnetism until it is intentionally removed by other means. Thus we have a recorded tape which contains a magnetic pattern corresponding to the variations in the current which was passed through the recording head.

To play back this magnetic pattern (convert it back to varying current again) the recorded tape is moved past another similar coil or "head." The moving magnetic fields from the magnetized oxide particles induce a correspondingly varying voltage in the turns of wire surrounding the head. When the head is connected to a closed circuit, a varying current will flow.

Adding a microphone and amplifier, we have the simplified magnetic recording diagram shown in Fig. 6. For play-back, the process is reversed, substituting a loudspeaker for the microphone.

This, of course, is an over-simplified picture of the tape recording set-up. Most professional machines, for example, have not just one, but three separate heads — one for erasing, one for recording, one for play-back. One of the big advantages of magnetic recording is the ease with which the tape

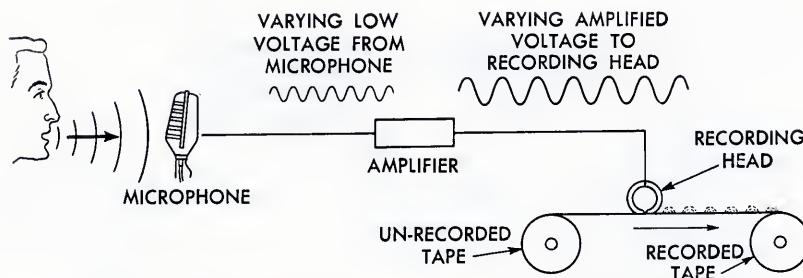


Fig. 6. Simplified schematic diagram illustrating basic elements of typical tape recording set-up.

can be "erased" and used over and over again. Also, it is easy to cut and splice. The quality obtainable with professional magnetic recorders is entirely comparable to that of a good professional disc recording. Many qualified engineers, however, still believe that disc recording has no equal for use where the most exacting quality requirements must be met.

The tape recorder, although a relative newcomer in the audio field, has already far exceeded the disc recorder in diversity of use, including practically all professional applications — plus a host of others, such as schools, colleges, religious and social service organizations, dramatic groups, industrial plants, research organizations, and the ever-growing ranks of home recordists. The relatively low cost of many tape machines — and the economy made possible by the re-use feature of the tape — are largely responsible for the phenomenal

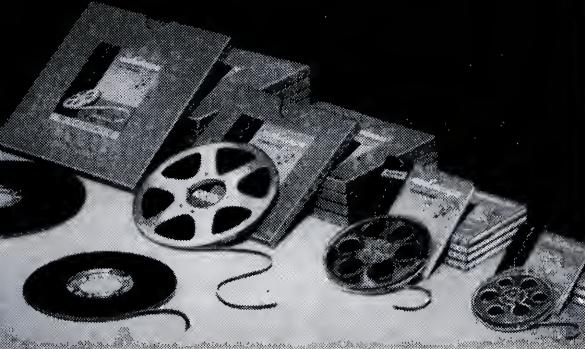
growth of tape recording within the past few years.

OPTICAL RECORDING

This method of sound recording is limited largely to motion picture and TV film applications. Briefly, it involves the recording of a photographic sound track on the film adjacent to the picture. A sound-modulated light pattern of varying area or intensity is "photographed" on the moving film. After being developed this sound track is reproduced by a light beam and a photoelectric cell which converts the varying light pattern into a correspondingly fluctuating current. Since this is a rather specialized field involving complex and costly equipment, it will not be discussed further here. It is interesting to note, however, that magnetic recording is already finding wide use in the motion picture and TV fields, and may eventually replace the photoelectric method entirely.

RECORDING TIME For Various Tape Speeds and Reel Sizes

REEL SIZE	3"	4"	5"	7"	10½"	14"
LENGTH IN FEET						
Audiotape	150	300	600	1200	2500	5000
Other Types	150	300	600	1200	2400	4800
RECORDING SPEED	TOTAL RECORDING TIME (Based on Audiotape footage)					
1 7/8" per sec. { Single Track Dual Track	16 min. 32 min.	32 min. 1 hr. 4 min.	1 hr. 4 min. 2 hr. 8 min.	2 hr. 8 min. 4 hr. 16 min.	4 hr. 26 min. 8 hr. 52 min.	8 hr. 52 min. 17 hr. 44 min.
3 3/4" per sec. { Single Track Dual Track	8 min. 16 min.	16 min. 32 min.	32 min. 1 hr. 4 min.	1 hr. 6 min. 2 hr. 12 min.	2 hr. 13 min. 4 hr. 26 min.	4 hr. 26 min. 8 hr. 52 min.
7 1/2" per sec. { Single Track Dual Track	4 min. 8 min.	8 min. 16 min.	16 min. 32 min.	32 min. 1 hr. 6 min.	1 hr. 6 1/2 min. 2 hr. 13 min.	2 hr. 13 min. 4 hr. 26 min.
15" per sec. { Single Track Dual Track	2 min. 4 min.	4 min. 8 min.	8 min. 16 min.	16 min. 32 min.	33 1/3 min. 1 hr. 6 1/2 min.	1 hr. 6 1/2 min. 2 hr. 13 min.
30" per sec. { Single Track Dual Track	1 min. 4 min.	2 min. 4 min.	4 min. 8 min.	8 min. 16 min.	16 1/2 min. 33 1/3 min.	33 1/3 min. 1 hr. 6 1/2 min.



The Complete
audiotape
Line

Length in Feet	Reel	Coating	TYPE NO.		List Price Each*	
			Wound On Reel With			
			Oxide Out	Oxide In		

PLASTIC BASE AUDIOTAPE

150	3" Plastic	Red Oxide	150	151	\$0.85
300	4" Plastic	Red Oxide	350	351	1.60
600	5" Plastic	Black Oxide	640	641	3.50
		Red Oxide	650	651	3.50
1200	7" Plastic, with New Large-diameter Hub†	Black Oxide	1240	1241	5.50
		Red Oxide	1250	1251	5.50
2500	Std. NAB Aluminum Hub Complete 10½" Al. Reel	Red Oxide	—	2551 H	10.00
		Red Oxide	—	2551 R	12.85
5000	Std. NAB Aluminum Hub Complete 10½" Al. Reel	Red Oxide	—	5051 H	20.00
		Red Oxide	—	5051 R	26.00

PAPER BASE AUDIOTAPE

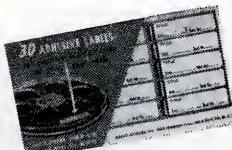
150	3" Plastic	Red Oxide	120	121	\$0.70
300	4" Plastic	Red Oxide	320	321	1.25
600	5" Plastic	Black Oxide	600	601	2.25
		Red Oxide	620	621	2.25
1200	7" Plastic, with New Large-diameter Hub†	Black Oxide	1200	1201	3.50
		Red Oxide	1220	1221	3.50
2500	Std. NAB Aluminum Hub Complete 10½" Al. Reel	Red Oxide	—	2521 H	6.50
		Red Oxide	—	2521 R	9.35

* Check your Audiotape dealer for liberal discounts to schools and colleges.

† This improved reel design, with 2 9/16" hub, gives more accurate timing, more constant pitch, slower rotational speeds, reduced tape tension and less head wear. Older style 7" plastic reels, with 1250 feet of tape, are available at the same price. When ordering 1250 ft. reels, add letter "S" to Type Number of corresponding 1200 ft. reel.

AUDIO SELF-TIMING LEADER TAPE

A 1/4" wide Leader Tape of durable white plastic material, for identifying recorded selections. Outlasts paper tapes many times over. Spaced markings permit accurate timing at all standard speeds. List price per box of 150 ft. \$0.60



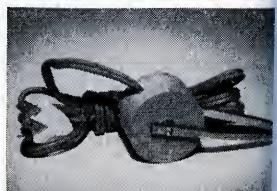
► INDIVIDUAL REEL LABELS

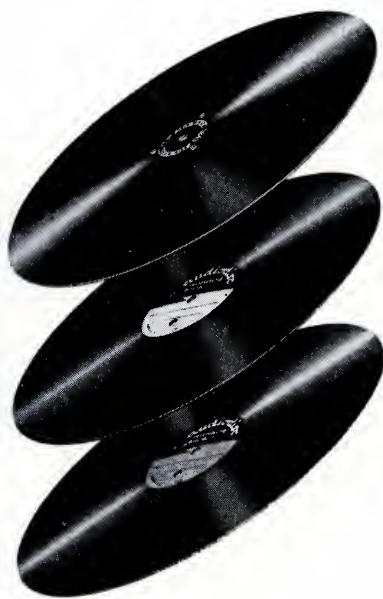
Convenient, press-on adhesive labels for positive identification of recorded tape reels. Easy to apply or remove. List price per pack of 30 labels... \$0.25



AUDIO HEAD DEMAGNETIZER

A 110-115 volt A-C electromagnet assembly with extended pole pieces, for removing permanent magnetism from magnetic recording heads. List price..... \$12.00





The Complete

audiodesc®

Line

Type		Diameter	Overall Thickness	Box Contains	List Price Each*
RED LABEL	Double Sided	7"**	.050"	25	\$1.15
		8"	.040"	25	0.90
		10"	.040"	25	1.25
		12"	.050"	25	2.05
		16"	.050"	25	3.75
	Single Face	12"	.050"	25	1.65
		16"	.050"	25	2.95
YELLOW LABEL	Double Sided	8"	.040"	25	.75
		10"	.040"	25	1.00
		12"	.050"	25	1.65
		16"	.050"	25	2.95
REFER- ENCE	Double Sided	10"	.040"	25	.85
		12"	.050"	25	1.25
		16"	.050"	25	2.25
BLUE LABEL	Double Sided	6½"	.027"	50	.40
		8"	.027"	50	.55
		10"	.027"	50	.80
MASTERS	Double Sided	12"	.050"	25	2.60
		13¼"	.065"	25	3.35
		17¼"	.065"	25	5.60
	Single Face	12"	.050"	25	2.05
		13¼"	.065"	25	2.35
		17¼"	.065"	25	4.10

* Check your Audiodesc dealer for liberal discounts to schools and colleges. Prices slightly higher in Pacific Coast and Southwestern Areas.

** Standard 45 rpm disc with 1½" diameter center hole.

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The outstanding choice of professional recordists for use where pressings are to be made.

Ask your dealer for descriptive leaflets on Audiotape, Audiodesc and Audiopoints. Or write to Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y. We will gladly send you any desired information and give you the name of the nearest dealer who can supply you with these Audio products.

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